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GAS ABSTRACTS

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1. GAS INDUSTRY

House Heating

SURVEY BY COLEMAN CO. INDICATES 6,390,447 GAS-HEATED HOMES. *Gas Age* 102, 32-33 (1948) *July* 8.

Gas is the principal heating fuel in 6,390,447 United States homes, this survey indicates. This represents a 71% increase in gas-heated homes over 1940. The statistics include both homes with central heating systems and those with room and space-heating appliances, but do not include several hundred thousand homes heated by LP-gas supplied from individual consumer storage systems. Of the total homes heated by gas, 17,563 are reported as using LP-gas and LP-gas-air mixtures supplied by utility companies, while the rest use either natural, manufactured or mixed gas. The statistics are broken down by states and are compared with the 1940 data.

J. C. Lane

Research

Gough, L. B. GAS RESEARCH PRODUCES RESULTS. *Public Utilities Fortnightly* 42, 493-494 (1948) *October* 7.

The American Gas Association has spent nearly $1,500,000 for research during the first three years of its expanded research program, and it expects to spend $400,000 to $500,000 during fiscal 1948-1949. The American Gas Association's projects include both fundamental and applied research. These projects are prosecuted at the Institute of Gas Technology, Battelle Memorial Institute and other research institutions, as well as at the American Gas Association's Testing Laboratory. A few examples of the type of research in progress are given in thumb-nail sketches of several of the projects sponsored by the American Gas Association.

J. C. Lane

Transmission

Casper, J. C. PIPE-LINE MOVEMENT OF NATURAL GAS IN 1948 WILL BREAK ALL PREVIOUS RECORDS. *Oil Gas J.* 47, 191-192 (1948) *September* 23.

The total miles of pipe line authorized by the Federal Power Commission from February 7, 1942 to June 30, 1947, amounted to 11,988 miles of which some 8,363 miles were authorized during the last 24 months of the period. In the 12 month period from June 1947 to June 1948, 8,468 more miles were authorized. Natural gas transmission will break all previous records during 1948, but will fall short of satisfying demands during the coming winter. A chart of demand trends shows that marketed production of natural gas has increased from approximately 7.8 billion cu ft per day in 1941 to an estimated 14 billion in 1948. During this same period, domestic demand for petroleum and petroleum products gained only about 43%. One of the primary reasons for the prodigious growth in natural gas demand is the fact that gas prices are now less than in the early 1930's while the prices of other fuels have increased. The wholesale price index, based on 1926 as 100, was 101.3 for natural gas in 1932 and had dropped to 88.7 by March of 1948. The wholesale price index for anthracite coal moved up from 88.4 to 124.6 during the same period, while that for bituminous coal more than doubled.

J. C. Lane

2. APPLIANCES

Calyx Burner

Bennett, A. R. and Harrison, D. USE OF THE CALYX BURNER TO DETERMINE COMBUSTION CONDITIONS. *Nature* (British) 162, 371-372 (1948) *September* 4.

Observation of a violet sheath (Calyx) forming around the lower edge of Bunsen flames was shown to be a method for determining the per cent of CO_2 in the combustion products, which could be used by service men to adjust appliance burners. This author reports that the extreme range of error, as a result of twelve different observers, was $\pm 1.5\%$ on the air to gas ratio. One observer had difficulty seeing the Calyx under any conditions.

E. F. Davis

House Heating

Morehouse, H. P. A LOW COST SOLUTION FOR HEATING BASEMENTLESS HOUSES. *Gas Age* 102, 17-20 (1948) *September* 16.

This new warm air heating system forces the air under the floor of a basementless home and then directs it through ducts into the house.

E. F. Davis

Radiant Heat

Musgrave, J. L. RADIANT HEAT. *Engr's. Digest* 5, 349-352 (1948) *September.*

It has been found that healing, particularly of bronchial complaints, is much more rapid with radiant heating than with convectors, for the absence of rapid connection currents retards the spread of germs which frequently delay post-operative recoveries, especially those of the throat, ear and nose. It is shown how radiant panels can be effectively employed for both heating and cooling of most all types of building and using various systems.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Powdered Coal

Carlson, H. M. FLOW METER FOR COAL-AIR MIXTURES. *Power Generation* 52, 76-77 (1948) *October.*

The author describes a system for measuring rates of flow of coal-air mixtures by means of a flow nozzle and an orifice in series. The principle of operation is that the coal affects only slightly the differential across a sharp edged orifice, but changes perceptibly the differential across a flow nozzle. The weight of coal flowing is calculated from the two differentials. The accuracy is claimed to be $\pm 5\%$ in mixtures of 0.5 to 1.4 lb coal per lb air and for coal pulverized so that from 75 to 92% passes through 200 mesh. The size of the coal particles affects the results indicated by the meter and correction factors must be applied. The device was tested on $\frac{3}{4}$, $1\frac{1}{2}$, 2 and 4 in. nominal pipe size lines. A picture of an installation and a calibration chart are presented.

W. J. Merwin

Steel Manufacture

Smith, R. P. EQUILIBRIUM OF IRON-CARBON-SILICON AND OF IRON-CARBON-MANGANESE ALLOYS WITH MIXTURES OF METHANE AND HYDROGEN AT 1000° C. *J. Am. Chem. Soc.* 70, 2724-2729 (1948) *August.*

Percentage of carbon formed in an atmosphere of CH_4 and H_2 at various mixtures, in contact

with several iron-silicon alloys (1.2 to 15% Si) with several iron-manganese alloys (4.0 to 14.5% Mn) at temperatures of 1000°C are presented graphically as well as in tabulated form. Data on activities of carbon relative to graphite, in austenite iron-silicon alloys and in austenite iron-manganese alloys at various percentages of Si and Mn respectively, as well as the activities of carbon of ferrite-iron silicon in the alpha-iron and the beta-iron are given. Methods used here for estimating the phase boundaries of both the iron-silicon and the iron-manganese alloys agree with previous experimental data obtained by others.

S. Mori

Turbines

Munzinger, O.A.F. A COMPARISON OF GAS AND STEAM TURBINES. *Combustion* **20**, 39-42 (1948) *September.*

The operation of the open and closed cycle gas turbine and a comparison of thermal efficiencies with steam turbine plants are presented. The author feels that there is little prospect for gas turbine competition entering the power field now dominated by large scale steam turbines, but that from the standpoint of efficiency and simplicity small to moderate 6000 KW gas turbines are competitive with steam turbines of similar capacity. A two stage closed cycle gas turbine can attain an efficiency in excess of 30% at an inlet temperature of 1300°F.

C. Von Fredersdorff

Tucker, S. A. HOW GAS TURBINES FIT INTO FUTURE POWER PATTERNS. *Mech. Eng.* **70**, 796, 802 (1948) *October.*

The principal reason for an increasing application of the gas turbine to power generation is its versatility in fulfilling specifications. Almost every application achieved or contemplated so far was based on some specific need that a gas turbine could meet to better advantage than a Diesel, gasoline or steam engine could. There is immediate prospect for gas turbine locomotives and ship propulsion units. Operating data will be forthcoming at an increasing rate as soon as gas turbine units installed in the United States, Rumania, Switzerland, Peru and Egypt complete endurance tests. It is believed that future demand for the gas turbine will be for very specific requirements with little concern as to its present high investment cost per horsepower ratio.

C. Von Fredersdorff

4. CARBONIZATION AND GASIFICATION

Benzole Recovery

Cellan-Jones, G. INCREASED BENZOLE YIELDS FROM COKE OVENS. *Coke & Gas* (British) **10**, 317-321 (1948) *September.*

By the controlled admission of cooled debenzolized coke oven gas through the oven crown so as to hold its temperature between 700 and 800°C, a 14% increase in benzole yield was realized. Such application of recycled cooled gas has further advantages in that: (1) lower oven crown temperatures and gas residence time minimize scurf or roof carbon formation; (2) less dissociation of ammonia occurs with consequent increase in ammonium sulfate yield; (3) free carbon content of tar is decreased resulting in greater yield of light oil from tar. The capital and operating cost of application of this method is nominal. Other devices for increasing benzole yield are traced.

C. Von Fredersdorff

Coal Oxidation

Belcher, R. THE ANODIC OXIDATION OF COAL. PART I. INTRODUCTION AND PRELIMINARY EXPERIMENTS. *J. Soc. Chem. Ind.* (British) **67**, 213-216 (1948) *May.*

The reactions which occur when coal is oxidized are briefly summarized. The earlier work of Lynch and Collett is the only previous at-

tempt at electrolytic oxidation. It is reviewed and their conclusions are summarized. A suitable assembly for electrolytic oxidation has been developed and excessive foaming has been eliminated. A vitrain was oxidized at a copper anode and the products were separated into ulmic acids and water soluble acids, the latter being further subdivided into ether-soluble and acetone-soluble portions. The ulmic acids were examined and appeared similar in type to those obtained from coal using other types of oxidants. The methods and results of the analyses are given in tabular form. In general the results confirm the findings of Lynch and Collett.

S. A. Zagnoli

Coal Solvation

Orchin, M. and Storch, H. H. SOLVATION AND HYDROGENATION OF COAL. *Ind. Eng. Chem.* **40**, 1385-1389 (1948) *August.*

Experiments on the pressure extraction of coal at 400°C. with a variety of solvents suggest a correlation between the degree of coal liquefaction and the chemical structure of the solvent. High boiling aromatic solvents, such as naphthalene, liquefy 20 to 30% of the coal; a readily dehydrogenated, hydroaromatic solvent, such as Tetralin, liquefies about 50% of the coal; hydroaromatic compounds containing a phenolic group, such as o-cyclohexylphenol or 1, 2,3,4-tetrahydro-5-hydroxynaphthalene, liquefy more than 80% of the coal and are at present the best known solvents for coal. The solvation process under these conditions probably involves a mild hydrogenolysis of carbon to oxygen linkages by the hydrogen available from the hydro-aromatic solvent and dissociation of the coal or primary products from the coal due to hydrogen bonding of the fragments with the hydroxylated solvent. The liquefaction of coal in the presence of high pressure hydrogen proceeds equally well with an aromatic or hydroaromatic compound, but best results are achieved with vehicles containing a hydroxyl group attached to an aromatic ring.

Authors' abstract

Coke Oven

THE FREE EXPANSION OVEN. *Coke & Gas* (British) **10**, 263-268 (1948) *August.*

Due to differences in the thermal expansion coefficient of silica and silico-alumina brick, oven walls of normal coke ovens expand more rapidly than the regenerator brick work with consequent cracking of the regenerator walls. The oven walls of a free expansion oven are built in separate pillars with sufficient space between pillars to allow for differential expansion. Upon heating, the differential expansion between oven wall brickwork and regenerator wall brickwork and carbon deposition causes complete closure of the pillars. An experimental free expansion oven indicated a completely satisfactory operation and upon cooling and dismantling showed no damage to brickwork due to shrinkage.

C. Von Fredersdorff

CV Retorts

Branson, J. O. CONTROL AND MAINTENANCE OF CONTINUOUS VERTICAL RETORTS. *Gas World* (British) **129**, 229-233 (1948) *August* 14.

Among important factors in the operation of continuous vertical retorts are: (1) tightness of all joints, caps and plugs; (2) cleanliness of gas offtakes; (3) condition of the top and bottom iron work; (4) use of steam to prevent damage to the bottom castings; (5) control of temperature of the silica brick linings; (6) proper scurfing procedures; and (7) maintenance of proper coal travel by adjustment of coke extractor speed. The plant must be well designed, the best materials of construction utilized, carefully started up, and attention to operating factors given, if a successful plant life is to be achieved.

C. Von Fredersdorff

Instrumentation

Lees, A. INSTRUMENTS OF GAS MANUFACTURE AND DISTRIBUTION. *Gas Times* (British) **56**, 263-266 (1948) *August* 27.

The author presents a flow chart for coal gas manufacture, briefly describes the process and indicates the type of instrumentation and the various stages in the process where it is advantageously employed. The various types of instruments, such as thermometers, pyrometers, flow meters, and manometers are then considered.

W. J. Merwin

Machinery

Harrison, H. C. MECHANICAL DEVELOPMENT IN THE GAS INDUSTRY. *Gas World* (British) **129**, 408-415 (1948) *September* 18.

The author briefly discusses materials handling machinery such as grab cranes, slew cranes, tippers, breakers, elevators, shiphoists, conveyors. The author is enthusiastic about the versatility and economy of the bulldozer. A table is presented showing the characteristics and performances of several sizes of bulldozers.

W. J. Merwin

Peak Load Gas

Maccormac, M. PRODUCTION OF PEAK-LOAD GAS BY THE PARTIAL COMBUSTION OF OIL. *Gas World* (British) **128**, 890-894 (1948) *June* 5. *Gas Research Board Communication GRB* 38 (1948) *April.*

See *Gas Abstracts* **4**, 193 (1948) *October* for abstract.

Pulverized Coal

Humphreys, C. G. R. EARLY DEVELOPMENT IN PULVERIZED COAL FIRING—PART I. *Combustion* **20**, 34-38 (1948) *September.*

The first of a series of articles on developments in pulverized coal firing is presented; it traces experience during the period 1807 to 1913. Several of the early attempts to burn pulverized coal were in connection with steel manufacture. Simultaneous combustion of lump and pulverized coals for steam generation proved unsuccessful. The more successful furnace developments included Crampton's revolving puddling furnace, Bettington's vertical boiler and Franklin's horizontal boiler.

C. Von Fredersdorff

Purification

Marshall, J. R. GAS PURIFICATION—WET AND DRY. *Gas World "Supplement"* (British) **124**, 105-114 (1948) *August.*

A history of the development of gas purification is given. Many processes for the removal of H_2S, HCN and organic sulfur compounds—CS_2, COS, C_4H_4S, mercaptans—from gas are summarized. Much detail is given of the dry purification of gas in oxide boxes for the removal of hydrogen sulfide. Tower purifiers in which oxide is used are also discussed. Several processes of liquid purification of gas, including the Seaboard and Thylox processes, are described.

C. Hummel

Pyrolysis

Prien, C. H. PYROLYSIS OF COAL AND SHALE. *Ind. Eng. Chem.* **40**, 1649-1659 (1948) *September.*

A complete summary of the literature from 1941 to date is presented, giving consideration to the mechanism, kinetics and chemistry of coal and shale pyrolysis. Other phases of the subject such as high- and low-temperature carbonization, oven operation, products and by-products and analysis are covered in this review.

C. Von Fredersdorff

The following article, which has not been abstracted, is called to your attention:

Van Dyke, B. H. ELLIOTT OXYGEN SYSTEM: HOW IT WORKS . . . DESCRIPTION OF CYCLE. *Petroleum Refiner* 27, 122-126 (1948) *October.*

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Automatic Controls

Parten, L. W. AUTOMATIC CONTROLS IN GAS OPERATIONS. *Petroleum Engr. (Reference Annual)* 19, 189-190, 192, 194, 196, 198, 200 (1948).

By means of charts the author explains the action of on-off control, proportional control, and proportional plus reset control. The mechanisms by which these types of controls are obtained are described. An application is mentioned of on-off control for cutting in a second meter run when the capacity of the first is reached. Proportional control is used in the gas industry in connection with weight loaded regulators in order to provide closer control. Proportional plus reset control is used on compressors where control is effected by a valve in the steam line of the engine. Valve characteristics are discussed.

W. J. Merwin

Compressors

Hofsess, R. W. CITIES SERVICE GAS COMPACTS SOIL TO FORM BASE FOR HEAVY ENGINE FOUNDATIONS IN HUGOTON FIELD. *Oil Gas J.* 47, 226, 228, 231 (1948) *September* 23.

The problems of foundation design connected with the installation of eleven 1600 hp compressors at a Cities Service Gas Company plant in the Hugoton field are discussed. Of the several alternatives available for securing a good foundation, it was decided that the most economical method would be to excavate down to the 22 ft level and refill the excavation to the 11 ft level with the same soil, but in compacted form. Careful control of the moisture content of the mix was necessary to secure good results. Pictures are presented showing various stages of the operations.

W. J. Merwin

Conservation

Love, F. H. NEW UNIT IN GAS CONSERVATION PROGRAM. *Petroleum Engr.* 19, 107, 110, 112, 115 (1948) *September.*

A new gasoline plant in the Tomoconnor field, Texas is described. Capacity is rated at 35 MMcf per day with about 2 gallons of liquid product per Mcf. At present 22 MMcf per day are processed producing 13,000 gal gasoline, 16,000 gal propane and 16,000 gal LP-gas. Plant data are given.

J. D. Parent

Corrosion

Senatoroff, N. K. FIFTEEN YEARS EXPERIENCE IN APPLICATION OF EXTERNAL CORROSION MITIGATION METHODS TO A HIGH PRESSURE NATURAL GAS TRANSMISSION LINE. ~~*Gas Age* 4, 479-491 (1948) *September 30.*~~ Corrosion October.

A discussion is presented concerning the method of soil corrosivity survey employed and the pipe line coating specifications adopted in the construction of a high pressure natural gas transmission line from Huntington Beach to San Diego, California. The later need and adoption of cathodic protection and the method employed for checking the operation and maintenance costs of this protection are explained. In the latter part of the paper the method of soil corrosivity survey, the coating specifications, and the cathodic protection are evaluated for this particular installation after 15 years service.

B. E. Hunt

Distribution

Farrar, L. D. A WELL-PLANNED SERVICE CHANGEOVER TO NATURAL GAS. *Public Utilities Fortnightly* 42, 467-470 (1948) *October 7.*

Details of the changeover in the Washington, D.C. area are presented.

J. D. Parent

LP-Gas

Bolander, G. INSTALLATION METHODS AND MOISTURE PROBLEMS IN [ABOVE-GROUND] TANKS. *Butane-Propane News* 10, 116, 118, 120, 123, 124 (1948) *October.*

In the second of a series of two articles, the author lists the precautions to be taken to prevent freezing in regulators. The first requirement is that the LP-gas and the tank containing it must be dry. Directions are given for swabbing a tank. Freezing of regulators may be minimized by using a larger diameter orifice or by using two regulators in series.

W. J. Merwin

Kramer, W. H. LP-GAS FROM THE GROUND UP. *Am. Gas J.* 169, 19-23 (1948) *October.*

General informationon the properties and methods of handling LP-gas is presented.

J. D. Parent

Mattock, O. USE OF UNFIRED PRESSURE VESSELS IN LP-GAS INDUSTRY. *Butane-Propane News* 10, 78, 84, 86, 88-90, 93-94 (1948) *October.*

A table is presented showing the relief valve flow requirements for various sizes of containers and various pressures as specified by the National Fire Protection Association. A table is also given listing the Interstate Commerce Commission and National Fire Protection Association maximum allowable filling densities for various containers when filled with liquids of specific gravity ranging from 0.473 to 0.634. It is pointed out that dikes should not be placed around LP-gas storage tanks. LP-gas tanks are satisfactorily supported by two piers, one at each end.

W. J. Merwin

Natural Gasoline

Garrison, M. E. BALANCED ECONOMIES IN GAS PLANT DESIGN. *Calif. Oil World* 41, 17, 19, 21 (1948) *September, 1st issue.*

The steps to be taken in designing an economical natural gasoline plant are given. Flow sheets and descriptions are presented for the absorption unit and the fractionation unit of the Burrel Gasoline Plant.

W. J. Merwin

Seeley, D. GRADE AND YIELD ESTIMATION OF NATURAL GASOLINE. *Oil Gas J.* 47, 86, 90 (1948) *September* 30.

The problem of evaluating liquid production as to grade and yield from gas or distillate wells is considered. Solutions are provided for special cases.

J. D. Parent

Purification

GAS PURIFICATION, DEHYDRATION PROCESSES. *Petroleum Refiner (Process Handbook Ed. Sec. 2)* 27, 269-279 (1948) *September.*

With the decline in available sweet gas and the increase in gas consumption the need for dehydrating and desulfurizing gases that were once rejected has become important. Five processes are described in detail giving materials of construction, operating conditions and capacities including the regenerative cycle. An annotated flow sheet accompanies each description. The five methods are: (1) Adsorptive Gas Dehydration Process using an activated bauxite; (2) Diethylene Glycol Gas

Dehydration; (3) Girbitol Process which uses aliphatic amines to remove acid gases; (4) Glycol-Amine Gas-Treating Process which is a combination dehydration desulfurization process; (5) Phosphate Desulfurization Process, of which the principal absorption reaction is

$$K_3PO_4 + H_2S \rightarrow K_2HPO_4 + KHS.$$

S. A. Zagnoli

Storage

Meiller, D. V. UNDERGROUND STORAGE OF GAS. *Public Utilities Fortnightly* 42, 481-482 (1948) *October* 7.

Public Service of Northern Illinois has installed underground storage facilities for 40 MMcf of natural gas. Forty foot lengths of 24 in. alloy steel pipe are used and a pressure of 2,240 psi is employed. Existing peak load and emergency facilities consisted of 5 carburetted water gas sets and a 5 MMcf low pressure holder. Propane storage was added. Combined facilities are adequate for two days supply of 50% natural gas, 25% propane and 25% carburetted water gas. The present storage cost is 60 to 65 dollars per Mcf, and it is felt that this is ⅓ to ⅕ of the cost of conventional holders.

J. D. Parent

Willien, L. J. OIL SEAL IN LOW PRESSURE HOLDERS. *Gas Age* 102, 29-34, 58, 60, 62, 63 (1948) *September* 16.

After eleven years of service, the 19,600 gallons of oil which was put on top of the water in a 6000 Mcf holder had disappeared to the extent that there was a sudden increase in the dew point of the gas from the holder. The author gives a very detailed account of how the conclusion was reached that the oil had been partially evaporated, and partly lost by adhesion to the holder walls. However, this evaporated oil was not causing customers' meters to read "slow." The author claims that spent transformer oil is suitable for a holder seal and recommends periodic dew point tests to determine whether or not the oil seal is effective.

W. J. Merwin

Tank Cars

THE REFINER'S NOTEBOOK—TYPES OF TANK CARS. *Oil Gas J.* 47, 323-324 (1948) *September* 23.

A summary is given of the regulations pertaining to tank cars as issued by the various official agencies. These include the Interstate Commerce Commission, the American Association of Railroads, The American Railway Association, and the United States Government. A table is presented listing the types of tank cars suitable for refinery commodities.

W. J. Merwin

Transmission

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS. *Gas Age* 102, 84-88 (1948) *September* 30.

The fundamentals of centrifugal compressors are presented.

J. D. Parent

Stark, E. L. INSTRUMENTATION ON EL PASO NATURAL'S TEXAS-CALIFORNIA LINE. *Oil Gas J.* 47, 213-214, 217, 307 (1948) *September* 23.

The instrumentation used in the compressor stations of the El Paso Natural Gas Company Texas-California Transmission line is described. Several panelboard layouts are presented. One new feature is that compressor speeds are recorded on a multipoint recorder. In essence the output voltage of a small generator attached to the engine shaft is used to indicate RPM. The discharge pressure at the header is controlled by setting individual engine speed governors pneumatically by diaphragm motors. The engine jacket water temperature is controlled by mixing cooled and uncooled water. An arrangement is also provided whereby cooling fans are cut in or out automatically to take care of load variations.

W. J. Merwin

Water Treatment

Ulmer, R. C. and Churchill, J. F. pH CONTROL THROUGH THE USE OF A SULFUR BURNER. *Calif. Oil World* 41, 12, 13, 15, 17 (1948) *September, 2nd issue.*

The authors describe a method by which the pH value of water may be reduced by burning sulfur and allowing the fumes to dissolve in the water. A table of operating data is presented.

W. J. Merwin

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Aromatic Hydrocarbons

Weizmann, C., Bergmann, E., Steiner, H. and Sulzbacher, M. PRODUCTION OF AROMATIC HYDROCARBONS FROM PETROLEUM. *J. Soc. Chem. Ind.* (British) 67, 114-118 (1948) *March.*

Hydrocarbon feeds can be cracked in packed tubes at temperatures of 1170-1260°F and at approximately atmospheric pressure to produce highly aromatic (95% or more) liquids. Metallic packing, especially copper, is effective. Sulfur, nitrogen and oxygen in the feed are converted mainly into hydrogen sulfide, ammonia and water, respectively. It appears that the hydrocarbons first form relatively small unsaturated molecules, which later recombine into cyclic hydrocarbons. Butadiene and other gaseous olefins are probable intermediate products. Yields of liquid increase (16-70% by weight) with increasing density of the liquid feed (0.72-0.82); conversely, yields of gases decrease as the density of the feed increases. Various other features of the process are also discussed.

C. H. Riesz

Fischer-Tropsch Catalyst

Leva, M., Grummer, M., Weintraub, M. and Storch, H. H. A STUDY OF FLUIDIZATION OF AN IRON FISCHER-TROPSCH CATALYST. *Chem. Eng. Progress* 44, 707-716 (1948) *September.*

Earlier correlations based on a study of fluidization of silica sand beds are reviewed. Data on the fluidization of iron powder are presented and it is shown that these data will fit the earlier correlations if corrections are made for the greater irregularity of shape of the particles. The authors then present a calculation showing how their correlations were applied to process design. It was shown that the maximum particle size of iron powder for which fluidization will occur depends on the ratio of fresh gas to recycle gas and on reactor diameter.

W. J. Merwin

Gasoline

Fookson, A. and Bell, A. D. SULFUR COMPOUNDS IN GASOLINE. *Petroleum Refiner* 27, 87-94 (1948) *September.*

A study of the occurrence of sulfur compounds in crude oils and their gasolines, straight run and cracked, is presented. These sulfur compounds are identified by classes and procedures are given for their determination. The adverse effects of these compounds on the octane number and lead susceptibility of gasolines are described. Increased wear of gasoline and diesel engines due to corrosion caused by sulfur-containing fuels is also discussed.

C. Hummel

Hutcheson, J. C. GASOLINE PLANT PROCESS WATER TREATMENT. *Petroleum Engr. (Reference Annual)* 19, 184, 186-187 (1948).

A report on a survey conducted in several gasoline plants operated by a major company in the Tulsa area is given. The author shows

what can be done to improve water treatment in plants using older methods and equipment through the use of various chemicals now available.

B. E. Hunt

Isotope Effect

Stevenson, D. P., Wagner, C. D., Beeck, O. and Otvos, J. W. ISOTOPE EFFECT IN THE THERMAL CRACKING OF PROPANE-1-C^{13}. *J. Chem. Phys.* **16**, 993-994 (1948) *October.*

In the pyrolysis of propane-1-C^{13}, significant differences in the reactivities of bonds to terminal C^{13} and C^{12} atoms were observed. With about 10% cracking at temperatures between 932 and 1022°F, 8% more frequent ruptures of C^{12}-C^{12} bonds were found than of C^{12}-C^{13} bonds. It also appears that C^{13}-H bonds are more reactive, contrary to expectations based on the known effect of mass on zero point energy. While the actual value observed is probably dependent upon wall effect, it emphasizes that the isotope effect should not be neglected in quantitative tracer experiments involving reaction rates.

C. H. Riesz

Low-Temperature Distillation

A NEW PLANT FOR THE LOW-TEMPERATURE DISTILLATION OF FUELS. *Coke & Gas* (British) **10**, 293-296 (1948) *August.*

Distillation of asphaltic rock is accomplished in a conical retort heated internally by recirculated gases which are preheated by gases and vapors leaving the retort and by external firing. Operating temperatures are controlled so as to reduce thermal cracking of the oil to a minimum. Operating data indicate 77 to 87% of the total oil contained in the rock was recovered, resulting in a gross thermal efficiency of 81.4 to 86.9%. An equivalent 22% of the recovered oil was consumed in power and heating, thus decreasing the thermal efficiency to a net value of 60 to 68.6%.

C. Von Fredersdorff

Petrochemical Processes

PETROCHEMICAL PROCESSES. *Petroleum Refiner (Process Handbook Ed., Sec. 2)* **27**, 337, 340-343, 346-347, 350-353, 356-361 (1948) *September.*

Flow diagrams and brief descriptions of 90 petroleum processes are presented. Gas conversion, purification and dehydration processes and petrochemical processes are of possible interest to gas engineers.

C. H. Riesz

Production

Slonnegar, J. C. DESIRABLE CHARACTERISTICS OF PUMPING UNITS AND ENGINES. *Petroleum Engr. (Reference Annual)* **19**, 120, 122, 124 (1948).

The need for standardization of sucker rod pumping units and internal combustion engines for driving these units is discussed. The geometry of unit pumpers should be standardized to give desirable torque-crank angle relationships. Flywheels storing 5000 ft-lbs of energy per hp at maximum rated speed should be used on all pumping engines. The use of a damped governor and a flywheel permits the use of internal combustion engines at full rated horsepower instead of the 65% recommended by the API. The stretch and vibration of a long string of sucker rods is briefly discussed.

O. Bloomer

7. ANALYTICAL METHODS AND TESTS

Analyzers

Bailey, G. B. GAS ANALYZER. U.S. 2,448,206 (1948) *August* 31.

This patent relates to a gas analyzer having a valve for controlling the sequence of operations in a gas analyzer of the Orsat type. Another design claims the prevention of liquid from rising above the 100% point of the burette and thus preventing its loss.

M. C. Miyaji

Nicolai, A. L. METHOD AND APPARATUS FOR MEASURING CONSTITUENTS OF GASES. U.S. 2,448,111 (1948) *August* 31.

The invention claims an apparatus for determining the volumetric per cent of oxygen in flue gases by the measurement of the magnetic susceptibility of that gas. A table of magnetic susceptibility for the constituents of the flue gases is presented and it is demonstrated that oxygen has by far the highest value of susceptibility relative to other constituents of the flue gases. Therefore slight variations in the relative amounts of the other gases make negligible effect of the measurement of oxygen.

M. C. Miyaji

Infrared Analysis

Daigle, E. C. and Lee, J. H. CALCULATING RESULTS OF INFRARED ANALYSES OF GASEOUS HYDROCARBON MIXTURES. *Petroleum Refiner* 27, 120-123 (1948) *September.*

A systematic procedure for the calculation of results of infrared analyses of gaseous hydrocarbon mixtures is described. The method employs a mechanical computer to solve the series of n linear equations in n unknowns. It may also be applied to the solution of mass spectrometer data.

S. Katz

Johnston, R. W. B., Appleby, W. G. and Baker, M. O. DETERMINATION OF OLEFINS IN GASOLINE. *Anal. Chem.* 20, 805-812 (1948) *September.*

The application of infrared spectroscopy to characterize olefins as to double bond position is described. It is shown that alpha-olefins and olefins with inner double bonds each have characteristic absorption bands. A silica gel adsorption technique is used to eliminate saturates and aromatic interference.

S. Katz

Saier, E. L. and Coggeshall, N. D. INFRARED ANALYSIS OF ORGANIC MIXTURES. *Anal. Chem.* 20, 812-817 (1948) *September.*

The use of a lithium fluoride prism to resolve C-H structure in the near infrared region is described and applications to the analysis of mixtures are discussed.

S. Katz

8. GENERAL AND PHYSICAL CHEMISTRY

Flame Speeds

Sherratt, S. and Linnett, J. W. THE DETERMINATION OF FLAME SPEEDS IN GASEOUS MIXTURES. *Trans. Faraday Soc.* (British) 44, 596-608 (1948) *August.*

A new procedure is proposed for the determination of flame speeds by measurement of the Bunsen flame cone. Arguments are advanced to show that the inner envelope rather than the cone surface is the determining structure. Application of the Mallard-LeChatelier formula to the determination of the effect of temperature on burning velocity of a coal gas-air mixture gives results in good agreement with experiment.

S. Katz

Flame Propagation

Hoare, M. F. and Linnett, J. W. THE MECHANISM OF FLAME PROPAGATION. *J. Chem. Phys.* **16**, 747-749 (1948) *August.*

The theory of hydrogen atom diffusion, proposed by Tanford and Pease (*Gas Abstracts* 3, 151 (1947) *September*) is not the sole explanation for the propagation of carbon monoxide flames. The thermal theory of flame propagation also explains the observed variations of burning velocity with composition. The relative importance of the two mechanisms remains to be established.

A. J. Rudnitzki

Surface Chemistry

Adam, N. K. FUNDAMENTAL ASPECTS. PRINCIPLES OF PENETRATION OF LIQUIDS INTO SOLIDS. *Discussions of the Faraday Soc.* (British) No. 3, 5-11 (1948).

Fundamental energy relations attending the penetration of a liquid into a porous solid are given.

J. D. Parent

10. CHEMICAL ENGINEERING

Distillation

Coulson, E. A. and Herington, E. F. G. FRACTIONAL DISTILLATION. I. THE SELECTION OF TEST MIXTURES FOR ESTIMATING THE EFFICIENCY OF FRACTIONATING COLUMNS. *Trans. Faraday Soc.* (British) 44, 629-636 (1948) *September.*

The use of the Fenske equation for measuring the plate equivalence of fractional distillation equipment is discussed. A thermodynamic analysis is presented.

J. D. Parent

Edmister, W. C. HYDROCARBON ABSORPTION AND FRACTIONATION PROCESS DESIGN METHODS. PART 16. PROPOSED MULTICOMPONENT FRACTIONATION CALCULATION METHOD. *Petroleum Engr.* **19**, 128, 133-134, 136, 138, 140, 142 (1948) *September.*

The author develops his own method of making multicomponent fractional distillation calculations based on absorption and stripping factors. It is felt that other shortcut methods suffer from uncertainty in the use of average relative volatilities or reflux quantities.

J. D. Parent

Yu, K. T. and Coull, J. APPLICATION OF ZYGOGRAPH TO DISTILLATION OF BINARY MIXTURES. *Chem. Eng. Progress* **44**, 795-800 (1948) *October.*

A new graphical approach to problems associated with the continuous fractional distillation of binary systems is presented.

J. D. Parent

Fluid Flow

Barrer, R. M. FLUID FLOW IN POROUS MEDIA. *Discussions of the Faraday Soc.* (British) No. 3, 61-67 (1948).

This is an excellent presentation of the equation for fluid flow through capillaries. It includes an excellent resumé of the equations for the flow of gases through porous media.

J. D. Parent

Carman, P. C. SOME PHYSICAL ASPECTS OF WATER FLOW IN POROUS MEDIA. *Discussions of the Faraday Soc.* (British) No. 3, 72-77 (1948).

The flow of fluids through capillaries at a rate

limited by viscosity of the fluid is treated in some detail.

J. D. Parent

Abstractor's Note: This article is a well-presented review.

Kneisel, O. LIQUID FLOW CHARACTERISTICS OF A PIPE LINE AND A CONTROL VALVE. *Petroleum Refiner* **27**, 101-104 (1948) *October.*

The problem of selecting proper size of control valve for a line is discussed.

J. D. Parent

Power Costs

Anson, I. A. COST OF ONE BRAKE-HORSEPOWER. *Oil Gas J.* **47**, 109 (1948) *September* 9.

A table is presented showing the cost of one brake-horsepower which is obtained by various means. The lowest cost is 0.31 cents for a gas engine, and the highest cost is 9.77 cents for a steam pump using fuel oil as a source of heat. The basic prices of the various fuels, their properties, and other factors which form the basis of the table are given.

W. J. Merwin

Pressure Drop

Weintraub, M. and Leva, M. PRESSURE DROP IN PACKED TUBES. *Chem. Eng. Progress* **44**, 801-802 (1948) *October.*

A nomograph is provided for estimating the pressure drop in a packed bed under certain conditions.

J. D. Parent

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control

Philbrick, G. A. and Kidd, W. H. PRINCIPLES OF AUTOMATIC CONTROL. *Chem. Eng. Progress* **44**, 675-680 (1948) *September.*

By means of graphs of controlled temperature versus time, and diaphragm pressure of the control valve versus time, the characteristics of the following types of control systems are presented: on-off; proportional control with moderate proportional band; proportional control with narrow band; proportional plus automatic reset control with various degrees of proportional band and varying speed of reset; and proportional plus automatic reset plus derivative action control.

W. J. Merwin

Equipment

EQUIPMENT. *LP-Gas* **8**, 50-70 (1948) *October.*

The equipment section of the LP-gas Equipment and Appliance Handbook describes the following items: tanks, vaporizers, mixers, cylinder testers, valves, gauges, change-over manifolds, regulators, meters, pumps, compressors, charging manifolds, cylinders, multiple heads, controls, safety pilots, moisture removers and accessories.

W. J. Merwin

Maintenance

Hulsberg, H. A. INSTRUMENT MAINTENANCE. *Petroleum Engr. (Reference Annual)* **19**, 178, 180, 182 (1948).

The author presents some of the qualifications

necessary for an instrument engineer and for the instrument mechanics. The requirements of an instrument shop are said to be a system of records, a small library, some machine tools such as: a lathe; drill press; grinder; etc., testing and standardizing equipment; and a generous supply of spare parts. The testing and standardizing equipment should include: a portable potentiometer; a dead weight tester; NBS thermocouples and thermometers; water column manometers and others. The author estimates that up to $15,000 worth of instruments justifies the employment of one instrument man.

W. J. Merwin

12. MATERIALS OF CONSTRUCTION

Alloy Steels

Jackson, R. and Sarjant, R. J. SPECIAL STEELS FOR THE PETROLEUM INDUSTRY. *J. Inst. Petroleum* (British) 34, 445-485 (1948) *July.*

In a 40 page article, the authors review the major factors involved in the selection of special alloy steels. Topics which are covered are as follows: effect of alloys on heat treatment; causes of corrosion; laboratory and service tests; scaling; properties at high temperature; fabrication of the steel; development of castings; and characteristics of typical steels for special purposes.

W. J. Merwin

Insulation

Bradley, C. B. and Stone, J. F. LOW-TEMPERATURE INSULATION. *Chem. Eng. Progress* 44, 723-726 (1948) *September.*

The selection of a thermal insulator for low-temperature insulation application is discussed. Curves are given for determining the thickness of insulation required for flat and curved surfaces based on the allowable heat entry into a system. A formula is included for determining the thickness of insulation which is most economical and which will prevent condensation when economy and prevention of condensation must be considered. A discussion is made of other important properties of an insulator which must be considered such as physical behavior at low temperatures, chemical inertness, combustibility, resistance to mechanical damage, and moisture resistance. Studies by the Johns-Manville Corporation indicated that a rigid block of amorphous, fibrous material is best suited for low-temperature insulation. This led to the development of a mineral wool block with resin binder which is marketed under the name of Zerolite.

E. J. Pyrcioch

McIntire, O. R. and Kennedy, R. N. STYROFOAM FOR LOW-TEMPERATURE INSULATION. *Chem. Eng. Progress* 44, 727-730 (1948) *September.*

Styrofoam is one of the plastic foams which have been developed in recent years. A plastic foam is an expanded high molecular weight polymer with a distinct cellular structure which in addition to the properties of low weight, good water resistance and high strength to weight ratio, have a low thermal conductivity. Styrofoam is a polystyrene foam developed by the Dow Chemical Company and was used during the war in buoyancy applications. Because of its large cell size it had a large K-factor [Btu/(hr) (sq ft) (°F./in)] which made it impractical for insulation use. By reducing the cell size the K-factor was reduced from 0.45 to 0.27. The mechanism of heat transfer through Styrofoam is mainly due to conduction through the air in cells, being 0.17 Btu/(hr) (sq ft) (°F/in), the remainder due to conduction through the polystyrene, convection currents and radiation. Being a thermoplastic, Styrofoam cannot be used with temperatures above 180°F, but is well adapted for low-temperature insulation applications. Its most important other property is resistance to water and to moisture

vapor penetration. This property is desirable since water or ice within an insulation increases heat losses. Installation tests on Styrofoam showed it may be adhered to walls and ceilings by hot asphalt; to masonry surfaces with Portland cement mortar; and may be plastered upon directly. Investigations into the amount of water picked up in some of the installations indicated a gain of moisture of only 0.25 to 0.75% by volume after two years of service at temperatures of —10°F to 0°F.

E. J. Pyrcioch

13. NEW BOOKS

High Vacua

Jnanananda, S. HIGH VACUA—PRINCIPLES, PRODUCTION AND MEASUREMENT. New York, D. Van Nostrand Company, Inc., 1947.

This book presents the fundamentals of high vacuum technique in six chapters: I, Kinetic theory of gases, II, Vacuum pumps, III, Gauges, IV, High vacuum techniques, V, Preparatory operations, and VI, Physical chemical methods of evacuation. The book is written in a straight forward readable style and contains a tremendous amount of information. No important phase of vacuum techniques appears to have been neglected, and virtually every device is illustrated. In the reviewer's opinion, there are few, if any, other books which treat this subject with comparable thoroughness.

S. Katz

Industry Yearbook

INTERNATIONAL INDUSTRY YEARBOOK. New York, Kristen-Browne Publishing Co., 1948.

This is the first of a series of annuals with the purpose of providing a broad horizontal review of the technical advancements achieved in the various fields of engineering and industry. It is written in semi-technical language by a number of contributors, each writing from the viewpoint of the relation of his particular field to industry as a whole. Pictures, flow-diagrams and bibliographies are included in each section. Of particular interest to the gas industry are the sections on chemical industry, including a discussion of synthetic fuels, and petroleum.

L. Ciboch

Physical Chemistry

Daniels, F. OUTLINES OF PHYSICAL CHEMISTRY. New York, John Wiley & Sons, Inc., 1948.

This book is a fuller revision of the Getman and Daniels "Outlines of Physical Chemistry." The arrangement follows closely the form of the seventh edition (1943) except for the references which have been thoroughly revised and the reactions on atomic and nuclear structure which have been rewritten to include recent advances.

S. Katz

Properties of Gases

Geyer, E. W. and Bruges, E. A. TABLES OF PROPERTIES OF GASES. New York, Longmans, Green & Co., 1948.

Written primarily with the needs of combustion engineers in mind, this book presents initially a discussion of the principal thermodynamic properties, followed by a lengthy, but very clear, well-written discussion of the application of thermal data to the solution of various types of heat engine problems. The tabulated data are given in English (fps) units at 100°F intervals. The tables include entropy, internal energy, enthalpy and free energy data for oxygen, nitrogen, carbon dioxide, water vapor, carbon monoxide, hydrogen, hydroxyl (OH), and nitric oxide. In addition tables of equilibrium constants and heats of reaction for a number of the principal combustion reactions and some properties of methane, ethylene, benzene and octane are given.

S. Katz

Thermodynamics

Lichty, L. C. THERMODYNAMICS. New York, McGraw-Hill Book Company, Inc., 1948.

Starting with the basic definitions of thermodynamic properties such as pressure, volume, temperature, and energy, the author develops the elementary equations for (1) the properties of pure media, mixtures of media, and (2) thermodynamic processes and cycles including internal combustion engines and gas turbines. An interesting discussion is given on availability of energy, a topic to which a complete chapter is devoted. Basic considerations of the flow of fluids are derived from energy, mass, momentum and entropy relationships. A voluminous appendix includes a summary of thermodynamic equations; tables of properties of steam, ammonia, and carbon dioxide; compressibility data; and Mollier diagrams of steam, and ammonia. The text is easily understood and is amply illustrated by sample calculations.

C. Von Fredersdorff

The following bulletins of the Institute of Gas Technology Research Bulletin Series are called to your attention. A limited number of copies of these bulletins are available for free distribution to Associate Members of the Institute of Gas Technology, while others may obtain them for the price indicated. Address the Director, Institute of Gas Technology, Technology Center, Chicago 16, Illinois.

No. 1 Storage of Natural Gas as Hydrate, by Joseph D. Parent. 1948. $2.50.

No. 2 Equilibrium Compositions and Enthalpy Changes for the Reactions of Carbon, Oxygen and Steam, by Joseph D. Parent and Sidney Katz. 1948. $10.00.

No. 3 Supplying Household Heating Services by High Temperature Circulating Liquids and Vapors, by Edward F. Davis, Joseph J. First and Ralph E. Peck. 1948. $2.50.

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